FRACTURES OF THE NECK OF THE FEMUR,[1]

WITH A REPORT OF TWELVE CASES TREATED BY THE THOMAS HIP-SPLINT.

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THE object of this paper is to call attention to a means for the treatment of fractures of the neck of the femur which I believe has not heretofore been employed in this country, namely, treatment by means of the Thomas hip-splint.

Dr. Ridlon's Case. On January 2, 1891, Mrs. H., aged 74 years, while descending a flight of dark stairs, turned before reaching the lower stair, stepped unexpectedly on its edge, and being a stout woman, fell heavily, striking on the right side. The ankle and knee were sprained and the neck of the femur fractured. She was seen at once by Dr. H. M. Hooper, of Rutherford, N. J., then practicing at Staten Island. Drs. Walser and Martindale were called in consultation and examined the patient twice, once without and once under an anæsthetic. The diagnosis of fracture of the neck of the femur was made certain, the usual result prognosticated, and the limb was put up in the long side splint, weight and pulley and sand bags. The patient suffered so much from pain during the days and from starting pains during the nights that she was losing strength and courage, and it was found so difficult to move her for change of bedding and the adjustment of the bed-pan that I was called to devise some means of relief. On January 14, twelve days after the accident, I applied the Thomas hip-splint with retentive traction. At that time there was one-half inch of shortening, but no other noticeable deformity.

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The movements at the joint were not tested—indeed, the limb was not moved from its position in the bed during the application of the splint, which was effected without causing the slightest pain. All pain, excepting some starting at night, ceased within forty-eight hours, and the night pain ceased at the end of ten days. The patient remained perfectly comfortable and free from pain from that time on. The bed-pan could be used without difficulty and without causing the patient any suffering. At the end of eight weeks, on March 11, the splint was removed in the presence of Dr. J. R. Williford, of Memphis, Tenn., and the joint motion tested for the first time. Union was found to be perfect and sound; motion was free and painless in all directions, and no tenderness was found on palpation. The knee was stiff. The patient remained in bed without treatment four or five weeks longer, getting up for the first time on April 9. She walked with crutches, or crutch and cane until August 15, when she was able to put both away and walk without difficulty, except such as arose from a somewhat stiff knee. After the removal of the splint, the patient was next examined by me on April 24, 1892. She can go up and down stairs unaided, and walks without crutch or cane and with scarcely a noticeable limp. There is normal motion, perfectly free and painless, at the hip-joint in all directions; the knee can be flexed only 48 deg.; and the ankle is somewhat stiff and thicker than normal.

Dr. J. R. Williford's Case.—Martha Bumpas, aged 70 years, patient of Dr. Walter Stewart, of Memphis, Tenn., made a misstep and fell to the ground on November 30, 1891. A temporary dressing, consisting of a bandage around the limb over two splints, was applied. On December 1, Dr. J. R. Williford, to whom I am indebted for permission to publish this case, was called in consultation; and two days later, December 3, he applied a Thomas hip-splint, which a blacksmith had constructed under his supervision, at an expense of $2.50. The diagnosis of fracture of the neck of the femur was based upon the pain about the hip, which was increased by any motion, eversion (outward rotation) of the limb, helplessness, the patient being utterly unable to move the limb, and slight crepitus with great pain on attempts to rotate the limb inward to its normal position. All pain ceased within a few hours after the Thomas splint had been applied. About three weeks after the commencement of treatment the patient was moved to another house, a distance of three miles, without pain or any suffering. The splint was removed on January 26, 1892, having been kept on seven weeks and two days. There was found to be three-eighths inch shortening, free motion in all directions without pain, and the patient was able to lift the limb in bed and move it freely about. The knee was somewhat stiff. She remained in bed five weeks longer, until March 3; and now, April 21, 1892, is walking without crutch or cane.

Mr. Robert Jones' Cases.—I am able through the kindness of Mr. Robert Jones, of Liverpool, England, to report upon ten of the forty cases treated by the late Hugh Owen Thomas and himself, these being all of the unpublished cases that Mr. Jones was able to hunt up in the time at his disposal.

Case 1. A. M., aged 65 years, tripped over a stone and fell sustaining a fracture through the neck of the femur. Shortening an inch and a half, eversion, and excruciating pain. Traction was applied by elevating the foot of the bed and fastening the foot to the bed frame; Thomas's hip splint applied; traction done away with at the end of a fortnight. The long splint was transformed into a walking splint and the patient allowed to go about on crutches; after four months the splint was removed. The patient fully recovered, and now two years afterwards is able to walk long distances without fatigue. There is half an inch shortening.

Case 2. Mrs. F., sent by Dr. Adam, a tall, gaunt woman aged 74 years, fell down stairs and fractured the neck of the femur. There was an inch shortening; the old lady was very anxious that the limbs should be of the same length; applied the Thomas splint with retentive traction. The patient was in bed for three months, being too timid to get up. She had an attack of eczema lasting through the whole period, dating from before the injury. There was no pain or inconvenience after the first week, and she was easily lifted in the splint by an attendant. Six months afterwards she was walking, with less than a quarter of an inch shortening, complained of no pain in the hip, and was able to sit down and get up again without assistance.

Case 3. Bridget McCarthy, aged 69 years, short and stout; fracture of the neck of the femur, complicated with chronic bronchitis. The region over the hip was acutely painful on pressure, the bed-clothes even giving her pain; three-quarters of an inch shortening. The hip being too painful to bear the pressure of the posterior bar of the splint, she was fitted with a double hip splint with that part of the stem at the back of the tender joint omitted. By this means she was kept under control, and by placing pillows above and below there was complete absence of pressure over the articulation. The patient made an admirable recovery. The head of the bed was elevated three feet because of the chest symptoms with the splint tied to the top of the bed to prevent slipping. The patient was walking with two sticks at the end of three months. There was three-quarters of an inch shortening.

Case 4. A. F., aged 67 years, fractured the neck of the left femur by direct force; fracture impacted; inversion; three-quarters of an inch shortening. Treated with the Thomas hip-splint in bed for six weeks. After two and a half months was walking with one stick. Fifteen months after injury was doing his work as a stableman in a team-owner's yard. Inversion was not noticeable in walking, although no effort was made at the time of the accident to disentangle the fragments.

Case 5. Mrs. Shirley, sent by Dr. McDougal, aged 60 years, tall and thin, fractured neck of right femur in getting out of bed, then fell heavily sustaining severe scalp wound. Had very little pain at the hip; there was eversion, crepitus, and one inch shortening. Hip-splint applied with retentive traction. No inconvenience from the splint; in bed seven weeks; insisted on getting up; splint shortened; gradually regained power, and ten months afterwards was able to walk a mile with one stick.

Case 6. A farmer, sent by Dr. Harcourt, aged 70 years, short and fat, fell from a haystack and fractured the neck of the right femur; suffered acute pain; great trochanter very prominent. The hip-splint was applied with the posterior bar made quite straight and of extra strength. Was very comfortable in the appliance after the first week. Shortening at the time of the accident one inch, which was reduced to half an inch. Was unable to move from bed for ten weeks: continued to wear the splint out of bed for three weeks. Shortening, eight months after the accident, half an inch. Complains of pain in the hip now and again, but is able to do some work on his farm.

Case 7. R. M., aged 72 years, sent by Dr. Shearer, fell getting out of a brougham; fractured the neck of the right femur; half an inch shortening; great pain down her leg, especially along the ham strings; a tall and thin woman with sensitive skin could not bear the carefully adjusted bar at the back of the fracture; a double splint, with bar at back of hip omitted, was applied. Remained in bed for two months; bore the modified splint easily; no pain after the first nine days. Was walking about in five months with two sticks; could get up and down stairs without assistance, and merely complained of weakness in the limb. The shortening was the same as at the time of the accident though at that time there was no impaction and crepitus was evident on slight traction.

Case 8. J. Holding, aged 80 years, strong and robust for his years, middle height, wiry and active, tripped over a footstool and fractured neck of left femur. Shortening scarcely preceptible; no pain in the joint except on movement; hip splint applied; no uncomfortable symptoms from the first; commenced to walk in two months; is now lame, twelve months after the accident, but can walk a mile with a stick without much discomfort.

Case 9. Mrs. K., sent by Dr. Sheldon, aged 65 years, thin and emaciated, fell and fractured the neck of the right femur; complained of pain in the back, and on movement; no impaction; crepitus elicited without searching for it; one and one-half inch shortening. The hip splint was applied, but the skin over the sacro-lumbar region became tender and the double splint with interrupted bar over the hip was applied, and all pressure was easily taken off the back by placing two padded bolsters, one underneath the upper part of the splint and the other underneath the lower part. The patient made an admirable recovery after having been in bed two and a half months. She went about in a modified double splint, cut short at the knees; and in this way was enabled to swing herself along for three weeks when the appliance was finally removed. The shortening was reduced to three quarters of an inch by merely stretching the leg well out and fastening it by adhesive plaster to the posterior bar of the splint.

Case 10. A woman, F. K., sent by Dr. Owen, aged 43 years, slipped and fell fracturing the neck of the femur. (This is the youngest of the Thomas–Jones series, excepting cases of epiphyseal separation.) She had only three-quarters of an inch shortening; marked eversion; great pain; no injury to the great trochanter. Was placed in the hip splint and kept in bed for two months; then in the short splint for two months. Now, eighteen months after the injury, is able to walk many miles without discomfort. There is nothing in this case on later examination to suggest extra-capsular fracture; no bossing of the trochanter, nor any thickening.

If one were to consider only the cases above reported, and the other cases treated with the Thomas hip-splint, fracture of the neck of the femur would seem no more serious than fracture at any other part of the bony skeleton. As a matter of fact, however, when treated by the usual methods it becomes a very serious matter indeed. Cruveilhier, Colles, Lonsdale and

B. Cooper denied the possibility of bony union in intracapsular fracture; Sir Astley Cooper admitted its possibility. Hamilton says: "It seems to me probable that, under certain favorable circumstances, this union will occur; these favorable circumstances have relation to several conditions, such as age, health, degree of separation of the fragments, whether impacted or not, laceration of the periosteum and capsule, treatment, etc. But such a combination of circumstances is probably exceedingly rare. The most common results of this fracture are as follows; The bones are more or less displaced; the acetabular fragment absorbed as far as the head; the trochanter fragment appears flattened from pressure and friction; ordinarily the two fragments move one upon the other without the intervention of any substance; but often they become united, more or less completely by fibrous bands, which bands may be short or long, according to the amount of motion which has been maintained between the fragments while they are forming; or to the degree of separation which exists; permanent shortening is the invariable result, and a few succumb to the injury within a month or two." Of the sixty cases collected by R. W. Smith half died within the first eight weeks, and in all that lived the functions of the limb were permanently impaired. Stimson says: "Fibrous union after fracture is demonstrated by several specimens; ossification is merely the ultimate step in the involution of the granulations arising from bone, and it has been shown in the study of failure of union, of pseudarthrosis, that the arrest of the process is commonly due to lack of immobilization, defective contact, or constitutional peculiarities of which old age is not one. Prolonged complete immobilization of a fracture of the neck of the femur is practically impossible, accurate coaptation of the fractured surfaces is a matter of chance, and the reason of the habitual failure to get bony union is to be found in the inability of the surgeon to meet the two principal indications of treatment, coaptation and immobilization, not in any inability of the tissues themselves to do the work required of them. . . . . The common result of this fracture is permanent disability, more or less complete. The patient is sometimes bed-ridden because of the pain provoked by motion and the general feebleness which makes it impossible for her to get about on crutches; or limited use of the limb with the aid of a cane, or its place may be supplied by crutches. The foot remains everted, the limb shortened."

The relative frequency of fracture within and without the capsule is still undetermined; and inasmuch as the differential diagnosis is not made in the majority of cases, and inasmuch as neither prognosis nor treatment are influenced by the location of the fracture, we will not consider the subject further.

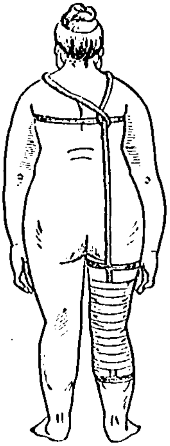

Fig. 1.

The ordinary form of splint, with shoulder strap applied, and without fixative traction.

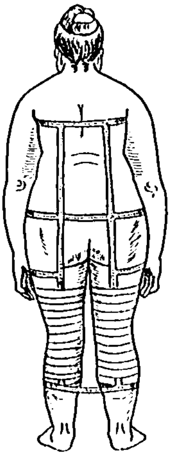

Fig. 2.

The ordinary form of double splint. Fixative traction applied and shoulder strap omitted.

The symptoms of fracture of the neck of the femur are: (1) Interference with function, which may be complete or only partial; (2) Pain, located about the hip or extending down the thigh; (3) Shortening, which may be only slight at first, but later may reach two inches; (4) Eversion, almost universally present to some degree; (5) Slight flexion and abduction; and 6) Crepitation, which may or may not be present, but should never be sought for. Post says (Trans. Amer. Surg. Assoc., 1883.): "The surgeon, in his anxiety to obtain a perfect diagnosis, moves the limb freely in all directions; he overcomes the impaction, ruptures the cervical ligament, demonstrates beyond all doubt the existence of fracture, and effectually destroys all hope of reunion. For my part, I prefer an imperfect diagnosis for the surgeon and a perfect limb for the patient, rather than a perfect diagnosis for the surgeon and a useless limb for the patient."

Treatment.—The treatment now most in use is by weight and pulley and the long wooden side splint, with the foot of the bed somewhat raised. The amount of weight used varies with the fancy of the surgeon from very little to fifteen or twenty pounds; one of the latest writers, Stephen Smith, commences with from one to four pounds and increases according to the indications. To the side splint some add a perineal band to prevent the patient from slipping down in bed, the splint being long enough to rest against the foot of the bed-frame. Or, the perineal band may be used as a means for counter-traction,

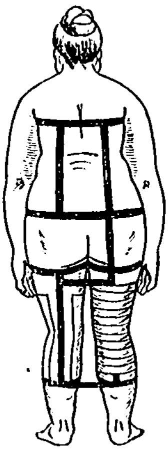

Fig. 3.

The modified double splint. Fracture of the neck of the left femur with too great tenderness at point of fracture to admit of any direct pressure. Section of main-stem omitted. Shows on left leg the manner of applying adhesive plaster for fixative traction.

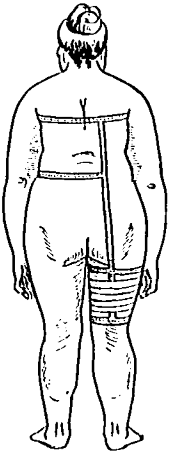

Fig. 4.

The short or walking, splint with adduction wing.

opposed to traction made by an elastic strap, or tube, fastened to the outer surface of the splint and acting through a cord passing over a pulley at the end of the splint to the stirrup. The disadvantages in this plan of treatment are: that there are no indications for traction in impacted fractures, indeed traction for any other purpose than for anchoring the foot to the bed is positively contra-indicated; that traction by weight and pulley, or by the elastic tube, is acting constantly and uninterruptedly whether the patient be asleep or awake, and in an unimpacted fracture there is no guarantee that the fragments may not be separated to too great an extent for advantageous union. Only the constant attention on the part of the surgeon and the constant application of the tape-measure during the early period of treatment give any assurance that too great lengthening or unnecessary shortening has not taken place, and even under constant supervision there is no guarantee that the same relative relations are maintained between the fragments during sleeping and wakeing. The most serious objection, however, is that the long side splint only immobilizes laterally to any considerable extent, whereas the chief tendency to motion is antero-posteriorly; especially is this so in nursing the patient. It is not necessary to dwell upon the fact which we all know but too well, that it is quite impossible to adjust the bed-pan without inducing a certain degree of antero-posterior motion.

Remembering that most of our patients are helpless and fat old women, it is not surprising that sound union so rarely occurs when in the treatment there is a lack of direct fixation, a lack of fixative traction, and only the everchanging surface of the bed upon which to rest the fractured part—it is rather more surprising that union occurs at all; that union does at times take place would seem to indicate a very strong tendency to repair if the broken bone could but have a fair chance.

A very decided advance would seem to have been made in the recommendation of the plaster of Paris splint, applied to one, or preferably both limbs from the feet upwards and extending to the axillæ. But a moment's consideration will show that the advantage is chiefly theoretical, and counterbalanced by equally serious disadvantages. A fat old woman cannot be placed in the position for the application of plaster of Paris from foot to axilla without the risk of breaking up any impaction that may be present, or moving one fragment upon the other to an injurious extent in unimpacted cases; nor can the splint be applied without the help of a very considerable number of trained assistants; nor can it be done in most cases without an anæsthetic, an objectionable feature in the aged; nor is it usually accomplished without the limb being left somewhat flexed in the permanent dressing. In women the plaster splint is with difficulty kept free from urine; hidden points of irritation are complained of and cannot be ignored without the risk of a pressure-sore, and the splint cannot be removed and another re-applied without more or less serious harm to the fractured part. Outside of hospital practice the plaster splint can have no permanent place in the treatment of these cases. We have mostly to treat elderly women who are more often stout than otherwise, and it becomes very important that means be used which least hamper them, and that we refrain as much as possible from all purposeless restraint. In the Thomas hip-splint we have an apparatus which secures posterior support to the fracture, gives fixation without compression of the fractured region except posteriorly, allows the patient to be lifted with ease, does not interfere with the groin, favors cleanliness, admits fixative traction, can be applied without moving the patient and without assistance, and presents no difficulties after the initial application.

The splint is made from soft iron and consists of a main-stem, a chest-band, a thigh-band and a calf-band. The stem is an inch and a quarter wide and one-fourth inch thick, and in length reaches from the axilla to the calf of the leg, the length of the lower portion from the hip-joint to the calf of the leg being equal to that from the axilla to the hip-joint. In the part opposite the buttock two gentle bends are made, the lower somewhat backward and the upper upward so that the body and leg portions of the splint follow parallel lines from one-half to one inch apart, the body-portion being posterior to the leg portion. The stouter the patient, the more nearly do these parallel lines coincide, and in some cases the main-stem may be left entirely straight. To the lower end is fastened by one rivet the calf-band, one-sixteenth by five-eighths inch, and in length an inch or two less than the circumference of the leg at this point.

The thigh-band is one-sixteenth by three-fourths inch, and in length an inch or two less than the circumference of the thigh at its largest part; it is riveted to the main-stem just below the lower bend, so that when applied to the patient it comes well up to the perineum. The chest-band is three-thirty-seconds by one and one-fourth inch, and in length nearly equal to the circumference of the chest, being relatively longer than the other bands; it is fastened by one rivet after the upper end of the stem has been forged flat and bent back over it. This arrangement makes a fast joint and brings the stem between the chest-band and the skin. In each end of the chest-band a round hole is forged of at least one-half inch diameter. The splint is now bent to approximately fit the patient, padded on the side which is to come next the skin with a quarter inch thickness of felt, care being taken to leave no inequalities of surface, and then covered with basil leather put on wet and tightly drawn, so that when dry it will have shrunk sufficiently to prevent the cover from slipping on the iron. The splint is applied by opening out the wings of the bands looking to the uninjured side of the patient and then slipping them, followed by the stem, underneath the patient from the injured side; the wings which were straightened are bent again by hand and readily return to their former curves. A closer and more accurate adjustment of the wings may be made by the use of the wrenches; these will be found especially servicable in fitting the chest-band and in drawing in the other bands when the patient is very intolerant of any threatened movement or jarring. When it is possible it is better to fit the splint to the patient before she has been moved from the spot where she has fallen. The splint having been fitted, if retentive traction is not required, the limb is bandaged to the stem from the calf to the upper part of the thigh, rolling the bandage in the direction the opposite of the rotary deformity which may be present; then shoulder-straps are applied by taking a couple of yards of broad bandage, or a strip of muslin, looping it around the stem where it joins the chest-band, thence over the band and up over the shoulders and down to the ends of the chest-band where it is passed through the holes and tied, and then passed across the intervening space to the opposite hole and again tied. If retentive traction is desired the shoulder-straps are omitted;

in a thin patient the limb, after having been pulled down in the splint, can be secured by a figure-of-eight bandage fastened to the splint with a large pin passed through it and the covering at the back of the splint, but in a stout person this will rarely hold, the splint slipping down or the limb riding up; then we apply a broad strip of adhesive plaster to each side of the limb from the upper part of the thigh turning the lower ends outward and upward around the wings of the calf-band, where they are fastened by a strip of plaster passed entirely around the limb, the whole is then covered with a bandage as in the first instance. By this arrangement the limb is pulled upon only to the extent of correcting the actual shortening, and is held at one and the same length sleeping or waking, whether the muscles relax or are spasmodically contracted. The device aims to prevent motion in the axis of the limb; to prevent lateral motion by bending the limb in any direction; to do this without circumferentially constricting the region of the fracture, and to enable the patient to have the bed-pan adjusted without pain and without disturbing the relation of the parts. When the splint has been applied and the patient is in bed, the nurse should be instructed in certain manœuvres: The bed-pan is adjusted by passing an arm under both limbs at or below the knees and then lifting directly upwards, making an incline of the whole patient below the chest-band. By this manœuvre it is also more easy to smooth out wrinkles in the bedding and change the sheets than in the usual way. The skin pressed upon by the stem should be changed night and morning by pulling it slightly at first to one side and then to the other, and the patient should be inspected daily for pressure-sores by turning her on the sound side. To turn a patient upon the sound side, support the fractured limb at the knee with one hand and grasping the chest-band with the other the patient is readily turned as a whole. The points most likely to suffer from pressure are those at the junction of the thigh-band and stem, the lower bend of the stem, and the junction of the stem and chest-band. Points pressed upon should be lightly dressed with balsam of Peru and protected from further pressure by padding above and below the point. If the pressure of the whole body portion of the stem is complained of, a small, thin mattress of hair, or a sheet folded to several thicknesses, may be placed between the splint and the patient's back. Threatened hypostatic congestion is obviated by raising the head of the bed from one to three feet, and the patient is prevented from slipping down in the bed by tying the splint to the head of the bed.

In all cases obviously unimpacted and in all cases where the shortening is more than three-quarters of an inch fixative traction should be applied. All patients that are exceedingly feeble had best be placed upon the double splint. In all cases the splint should be kept on for from six to eight weeks after all pain has ceased; then the patient should remain in bed for four weeks longer without any treatment whatever, unless there be some positive indication to the contrary, in which case the splint is cut off at the knee and the calf-band riveted at this point, and the patient may then be permitted to go about with crutches. During the early period of treatment the diet should be restricted and regulated with the idea of avoiding a movement of the bowels for as long a time as possible. No cathartic should be given, for the bowels will surely move spontaneously by the end of the third week; after this the diet need not be restricted.

Thomas held the following to be the essentials of treatment:

1. To uninterruptedly and as effectually as possible arrest flexion at the hip joint.

2. To continue the treatment until the symptoms of genuine repair and soundness of the joint are diagnosed.

3. To obtain the best possible restoration circumstances permit, so that no lameness attributable to flexion be a permanent reminder of treatment.

And I quite agree with Stimson that the principle aim of treatment should be to keep the inflammatory reaction within the narrowest limits and to secure union at the earliest possible moment even if in a faulty position; that the first consideration is to keep the patient alive, the second to obtain good union, the third to get union in a good position.

Disability due solely to a shortened limb should not be classed as a bad result inasmuch as such disability may result from an impacted fracture—the profession being a unit in holding that the intentional breaking up of an impacted fracture is unjustifiable; but disability due to a sensitive and painful joint, and to flexion which almost invariably accompanies such a condition, is curable, and should not, as it often is, be mistaken for delayed or non-union. Sound union in good position may still leave the patient for a time with a painful and useless limb, while entire absence of bony union may leave a painless and useful limb though still withal a short one.

There is a class of cases called by Thomas, "Simulated fracture of the neck of the femur," which may be referred to here. The patient suffers an injury to the region of the hip joint; no evidence of fracture can be made out at the time, but after the lapse of some days or weeks many of the signs of fracture may be found: apparent shortening, eversion and deformity, evident by the flexion test. .These differ in no manner from the signs of simple inflamed hip joint, and can be diagnosed as not a fracture of the neck of the femur by the surgeon placing simultaneously the palms of his hands upon the patient's trochanters; when he will notice that in fractures the trochanter of the defective limb is slightly or distinctly prominent, and sometimes higher than that of the sound side; this differential diagnosis is not of much practical value, as the details of treatment are nearly alike, whether there be fracture or not; in these cases the fixative traction is not usually applied.

The fact that two cases, or several, have recovered under this treatment is of little significance, and it is not to illustrate brilliant results that these cases are reported. They are reported because I believe them (the first two) to be the only ones treated with this apparatus in this country, and because they serve as a text for that which is much more essential than the details of any method, namely, a consideration of the principles of the treatment of fractures involving or in the immediate vicinity of joints, principles equally applicable to fracture of the patella and olecranon.

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